



AMENDMENT UNDER 37 C.F.R. § 1.111
Appln. No.: 10/774,498

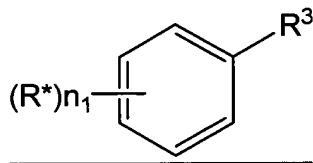
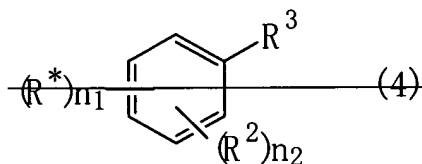
Docket No: Q79804

AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions and listings of claims in the application:

LISTING OF CLAIMS:

1. (currently amended): A process for preparing an optically active biaryl compound of the formula-(4) below:



wherein

R^* is the same or different and represents a substituent having at least one asymmetric carbon,

R^2 is the same or different and represents a fluorine atom, a cyano group, a nitro group, a

substituted or unsubstituted linear or branched alkyl group, a substituted or unsubstituted

cycloalkyl group, a substituted or unsubstituted aryl or heterocyclic group, a hydroxyl group, an

alkoxyl group, an aryloxy group, an alkylthio group, an arylthio group, a protected amino group,

a substituted or unsubstituted carbamoyl group, a substituted or unsubstituted sulfonamide group,

a formyl group, an alkylcarbonyl group, an arylcarbonyl group, a carboxyl group, an

alkoxycarbonyl group, or an aryloxy carbonyl group, or

~~the substituents on the adjacent carbon atoms of the benzene ring may be bound each other and taken together with the benzene ring to form a fused polycyclic aromatic ring,~~

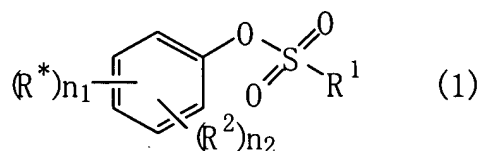
R^3 is a substituted or unsubstituted aryl or heteroaryl group,

n_1 is an integer of 1 to 5,

~~n_2 is an integer of 0 to 4, and~~

* is as defined hereinafter,

which comprises reacting an aromatic sulfonic acid ester compound of the formula (1):

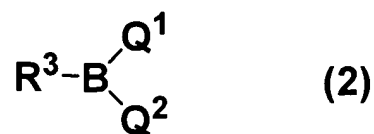


wherein

R^1 is a substituted or unsubstituted alkyl or aryl group, and R^2 , R^* , n_1 , and n_2 are as defined hereinabove,

provided that R^1 is not a trifluoromethyl group, a nonafluorobutyl group or a pentafluorophenyl group,

with an organic boron compound of the formula (2):

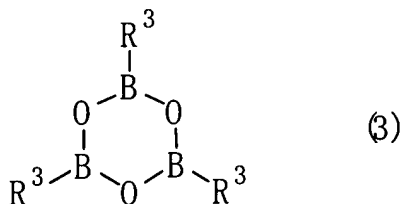


wherein

R^3 is as defined above, and

Q^1 and Q^2 are the same or different and each is a hydroxyl group, or an alkoxy group having 1 to 4 carbon atoms; or Q^1 and Q^2 are taken together to form an alkylendioxy group having 1 to 4

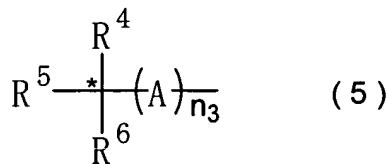
carbon atoms or 1,2-phenylenedioxy group, which is optionally substituted with an alkyl group having 1 to 4 carbon atoms, or
a boroxine ring compound of the formula (3):



wherein R^3 is as defined hereinabove, or

a mixture of compounds of the formula (2) and the formula (3), at 70°C or below in the presence of a nickel catalyst and a base.

2. (original): The process according to claim 1, wherein the substituent R^* is a group of the formula (5):



wherein R^4 , R^5 and R^6 are different and each is a hydrogen atom, a fluorine atom, a substituted or unsubstituted linear or branched alkyl group, a substituted or unsubstituted cycloalkyl group, a hydroxyl group, a substituted or unsubstituted alkoxy group, a substituted or unsubstituted aryloxy group, a cyano group, a protected amino group, a formyl group, a carboxyl group, a substituted or unsubstituted alkoxy carbonyl group, a substituted or unsubstituted

aryloxycarbonyl group, a substituted or unsubstituted carbamoyl group, a substituted or unsubstituted heterocyclic group, or a substituted or unsubstituted aryl group,

A is a substituted or unsubstituted alkylene group, a substituted or unsubstituted nitrogen atom, oxygen atom or sulfur atom,

n_3 is an integer of 0 or 1, and

the carbon atom marked with * is an asymmetric carbon atom.

3. (original): The process according to claim 1 or 2, wherein R^1 is a methyl group, a phenyl group or a p-tolyl group.

4. (previously presented): The process according to claim 1, wherein a ligand is used in addition to the nickel catalyst.

5. (previously presented): The process according to claim 1, wherein the ligand is trialkylphosphine.

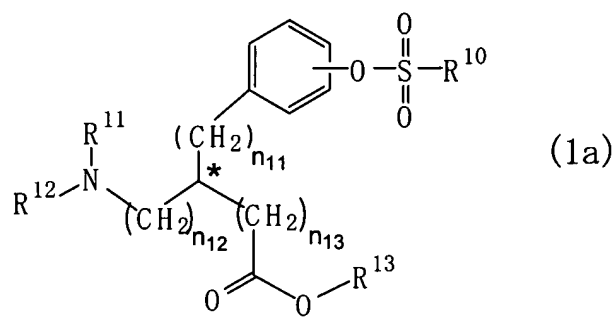
6. (previously presented): The process according to claim 1, wherein the base is alkali metal hydroxide, alkaline earth metal hydroxide, alkali metal carbonate, alkaline earth metal carbonate, alkali metal hydrogencarbonate, alkali metal alkoxide, alkaline earth metal alkoxide, alkali metal fluoride, tertiary amine or a mixture thereof.

7. (previously presented): The process according to claim 1, wherein the base is cesium carbonate.

8. (currently amended): The process according to claim 1, wherein the nickel catalyst is a zerovalent nickel catalyst.

Claims 9-14 (canceled).

15. (currently amended): A process for preparing ~~the compound~~ an optically active biaryl compound of the formula (1a); ~~according to claim 9~~



wherein

R¹⁰ is a substituted or unsubstituted alkyl or aryl group,

R¹¹ is a protecting group for an amino group,

R¹² is a protecting group for an amino group, or a hydrogen atom,

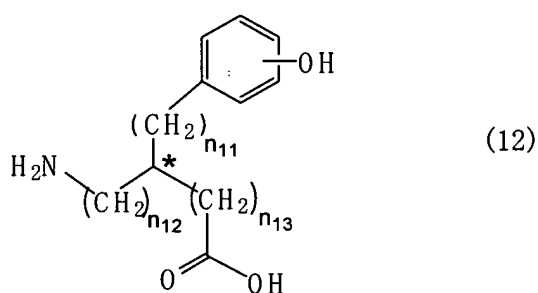
R¹³ is a substituted or unsubstituted alkyl group, or either R¹¹ or R¹² and R¹³ are taken together to form a protecting group for amino acid,

n_{11} , n_{12} and n_{13} are each independently an integer of 0 or 1,

the carbon atom marked with * is an asymmetric carbon atom,

provided that R^{10} is not a trifluoromethyl group, a nonafluorobutyl group or a pentafluorophenyl group,

which comprises the step of reacting a compound of the formula (12):



wherein n_{11} , n_{12} and n_{13} are each independently an integer of 0 or 1, and

the carbon atom marked with * is an asymmetric carbon atom, with an alcohol compound of the formula (13):

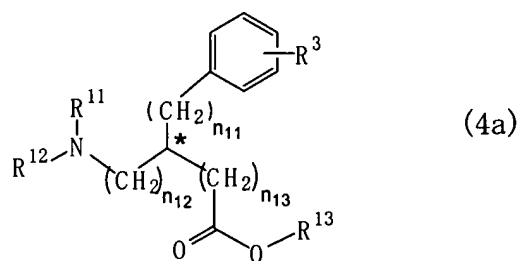


wherein R^{13} is a substituted or unsubstituted alkyl group, to protect the carboxyl group;

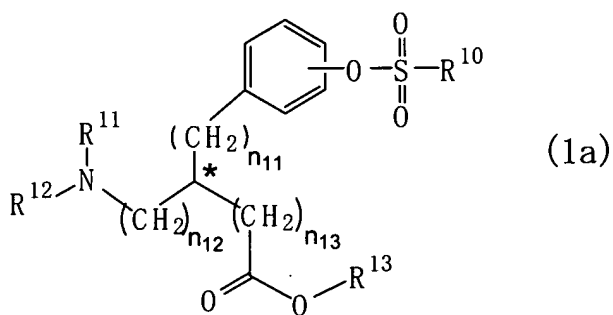
the step of introducing a protecting group for an amino group represented by R^{11} or R^{12} to protect the amino group; and

the step of introducing a $R^{10}SO_2$ group by a reaction of the phenolic hydroxyl group with a sulfonic acid esterifying agent to accomplish sulfonic acid esterification.

16. (original): A process for preparing an optically active biaryl compound of the formula (4a):



wherein R³, R², R³, n₁, n₂ and * are as defined hereinbelow, which comprises reacting an optically active aromatic sulfonic acid ester compound of the formula (1a):



wherein

R¹⁰ is a substituted or unsubstituted alkyl or aryl group,

R¹¹ is a protecting group for an amino group,

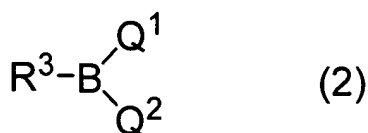
R¹² is a protecting group for an amino group, or a hydrogen atom,

R¹³ is a substituted or unsubstituted alkyl group, or either R¹¹ or R¹² and R¹³ are taken together to represent a protecting group for amino acid,

n₁₁, n₁₂ and n₁₃ are each independently an integer of 0 or 1, and

the carbon atom marked with * is an asymmetric carbon atom,

provided that R¹⁰ is not a trifluoromethyl group, a nonafluorobutyl group or a pentafluorophenyl group, with an organic boron compound of the formula (2):

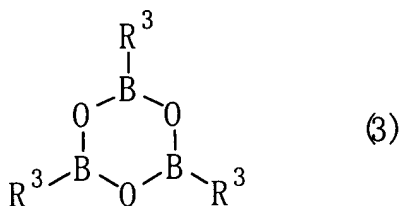


wherein

R³ is an optionally substituted aryl group or heteroaryl group,

Q¹ and Q² are the same or different and each is a hydroxyl group or an alkoxy group having 1 to 4 carbon atoms, or Q¹ and Q² are taken together to form an alkylenedioxy group having 1 to 4 carbon atoms or 1,2-phenylenedioxy group, which is optionally substituted with an alkyl group having 1 to 4 carbon atoms, or

a boroxine ring compound of the formula (3):



wherein R³ is as defined hereinabove, or

a mixture of compounds of the formula (2) and the formula (3), at 70°C or below in the presence of a nickel catalyst and a base.